

February 16, 1897.

Prof. GEORGE B. HOWES, F.Z.S., in the Chair.

Dr. E. C. Stirling, F.R.S., C.M.Z.S., exhibited some bones, casts, and photographs of the large extinct struthious bird from the *Diprotodon*-beds at Lake Callabonna, South Australia, which had been recently discovered and named by him *Genyornis newtoni*, and gave a history of the principal facts connected with its discovery¹.

Mr. G. E. H. Barrett-Hamilton, F.Z.S., exhibited a pair of tusks of the Pacific Walrus (*Trichechus obesus*), which he had purchased at Petropaulowsk, in Kamschatka. He regretted that he was unable to exhibit the skull, which he had also purchased, but which had not yet reached England. The present tusks were the largest of a good many which he had seen at Petropaulowsk; and it was a peculiarity of that place that the hunters there seemed to bring in the complete skulls of those which they kill, whereas the tusks for sale on the Alaskan side of the Pacific were, usually, removed from the skulls. This, however, was not a matter of surprise, considering the weight of the heads when complete.

The Pacific Walrus was not well known to English naturalists; and Mr. Barrett-Hamilton stated that he could find no tusks of this species either in the British Museum or in the Museum of the Royal College of Surgeons.

He considered that the Pacific Walrus was a good species or at least subspecies, and that the characters pointed out by Mr. J. A. Allen, in his Monograph of North American Pinnipeds, to distinguish it from the Atlantic form were correct. He regretted, however, that he himself had not had the good fortune to see the Walrus of the Pacific in life, as they were now exterminated in the parts of the North Pacific in which he had travelled. The tusks of the Pacific Walrus were very much larger than those of the Atlantic species, and Mr. Barrett-Hamilton stated that he had seen nothing in London which at all approached the size of the tusks now exhibited. In the Pacific, however, he had heard of the occurrence of larger specimens. The animal itself was also larger than the Atlantic form, and, according to Mr. Allen, had a very different facial outline. Besides some differences in the skulls by which the two species might be distinguished, the tusks in the Pacific form were usually more or less convergent, and Mr. Barrett-Hamilton had seen tusks which actually overlapped. "In the Atlantic species the tusks were, as a rule, divergent; while

¹ On this subject see 'Nature', vol. l. pp. 184, 206 (1894).

in the Pacific species the tusks descended almost vertically, in the Atlantic species they were quite uniformly strongly incurved" (Allen, *op. cit.* p. 168).

In reply to enquiries of Mr. Selater as to what Cetaceans and Seals besides *Otarie* he had met with in the Pacific, Mr. Barrett-Hamilton stated that he had not observed many Seals.

Seals of the genus *Phoca* (probably *P. vitulina*) were common in Tareinski Harbour, near Petropaulowsk, and there were Seals at St. Paul Island (Pribiloff group) which seemed to be very much larger than the common *P. vitulina* of the Atlantic. Mr. F. A. Lucas, of Washington, had procured a specimen of the latter, and it was possible that the species would be described as a new one, but there was no doubt that it was very closely allied to *P. vitulina*.

The form of *P. vitulina* met with on the coast of California had been described as a species in 1866 by Gill, under the name of *P. pealei*, but this separation had not been accepted by later writers.

Of Cetaceans he had seen the common Porpoise, which is abundant at San Francisco. Another species, *Phocena dalli*, was found on the Alaskan coast.

Dolphins he had seen frequently, but all were probably of the widely-distributed and pelagic species, *Delphinus delphis*.

Killers (*Orca gladiator*) were common in the autumn in the neighbourhood of the Seal Islands, and probably eat large numbers of the Fur-Seals. They usually swam in small companies very close together, and Mr. Barrett-Hamilton stated that at the Kommandorski Islands he had been within a few yards of a pair in a boat. The dorsal fin of some specimens hangs downwards in a very curious way as if it had been broken near the tip.

Captain Garforth, of H.M.S. 'Pheasant,' had informed Mr. Barrett-Hamilton that on the 13th of September (1896) Killer Whales were so numerous off Unimak Pass in the Eastern Aleutian Isles, that he had to stop the ship several times to avoid running into them. He thought it was no exaggeration to say that they were there in thousands.

The only other Whale which Mr. Barrett-Hamilton had met with was a Humpbacked Whale (*Megaptera* sp. inc.), which was very numerous about Unalaska. It was supposed to be of a different species from that found in the Atlantic, as was also the Black-fish (*Globocephalus*) of the Pacific, but there had been nothing positively settled on the subject.

He had not met with *Rhachianectes glaucus*, but had seen a few Fin-backed Whales (*Balaenoptera* sp. inc.) near Unalaska.

Some of the whalers had made good catches of the North Pacific Right-Whale (*Balena japonica*) this year, and Sperm Whales (*Physeter*) also occurred in the North Pacific.

The following papers were read:—

1. On *Echidnocephalus*, a Halosauroid Fish from the Upper Cretaceous Formation of Westphalia. By A. SMITH WOODWARD, F.Z.S., of the British Museum (Natural History).

[Received January 19, 1897.]

(Plate XVIII.)

In 1858 Dr. W. von der Marck¹ described a curious eel-shaped fish with well-developed pelvic fins and a separate short dorsal, from the Upper Cretaceous formation of Westphalia. He gave it the generic name of *Echidnocephalus*, and in 1863² he added to his description some rather sketchy figures of four specimens: In the last-mentioned year Mr. J. Y. Johnson presented to this Society³ a description of an existing fish from the seas off Madeira, remarkably similar in general aspect to the extinct form; and for this he proposed the generic name of *Halosaurus*, noting the aberrant characters which later induced Dr. Günther⁴ to make it the type of a distinct family, the Halosauridæ. The striking resemblance between these two fishes does not appear to have been hitherto observed; but, thanks to Dr. Günther's anatomical investigation of new specimens of *Halosaurus* obtained by the 'Challenger' Expedition⁵, it is now possible to demonstrate that the correspondence between the Cretaceous and Recent forms in question is exact even to some of the most specialized osteological features. I have not yet had the privilege of studying the original fossils referred to by Dr. von der Marck, but there are four very fine specimens from the same formation and locality in the British Museum. These form the subject of the following descriptions, and suffice to show very clearly how the strange Halosauroid type was already completely developed before the end of the Cretaceous period.

The finest specimen showing the head (Plate XVIII. fig. 1) is a little distorted in the anterior part of the abdominal region, and wants the hinder half of the tail. The head is exhibited in direct side-view, but its structure is very difficult to interpret, most of the bones being shown only in impression, while the opercular apparatus is crushed upon the hyoid and branchial arches, and the pterygo-quadrate arcade upon the more external bones. The cranium is long and narrow and much depressed, as indicated by a fragment of the parasphenoid (*pas.*) preserved in the orbital region. An impression of the parieto-frontal region suggests that the cranial roof was smooth and gently arched from side to side, without any occipital crest. Below the anterior three-quarters of the skull there is an impression of the pterygo-

¹ Zeitschr. deutsch. geol. Gesell. vol. x. (1858), p. 247.

² Palæontographica, vol. xi. (1863), p. 55, pl. viii. figs. 1-3, pl. xiv. fig. 1.

³ Proc. Zool. Soc. 1863, p. 406, pl. xxxvi. fig. 2.

⁴ Catal. Fishes Brit. Mus. vol. vii. (1868), p. 482.

⁵ A. Günther, "Report on the Deep Sea Fishes," 'Challenger' Reports, vol. xxii. (1887), p. 232, pl. lx. figs. 1-8.

quadrate arcade, very slender in front and reaching forwards almost as far as the symphysis of the mandible. The suspensorium is obviously much inclined forwards. The quadrate (*qu.*) is observed to be small and wedged between the ectopterygoid (*ecpt.*), entopterygoid (*enpt.*), and metapterygoid (*mpt.*). The mandible (*md.*) is long, elevated in the middle, and truncated at the symphysis; but although it articulates with the quadrate just behind the middle point of the head, the gape of the mouth seems to have been small, scarcely half the extent of the ramus entering the oral border. A stout marginal bone of the upper jaw is imperfectly shown sloping downwards and backwards from the end of the rostrum to a point just behind the mandibular symphysis, and this may be interpreted as premaxilla (*pmx.*). The mouth must have been distinctly inferior, the rostrum a little prominent. Behind the skull there is the smooth impression of a relatively small trapezoidal plate, which may be regarded as the operculum (*op.*); but its antero-superior border is not clearly defined. Adjoining this plate at its antero-inferior margin is another larger plate ornamented with fine, radiating striæ, which are evidently directed almost at right angles to its curved posterior and inferior border. This bone exhibits no connection with the mandibular suspensorium, which is considerably further forwards, and its precise shape cannot be determined owing to a crush upon the hyoid arch; it is evidently the suboperculum (*s.op.*). Impressions of nine slender and gently curved branchiostegal rays (*br.*) are shown, and are attached to a remnant probably of the ceratohyal. The vertebræ are merely shown in impression, but they are extremely numerous, while the centra are short and deep, each marked by fine longitudinal ridges. The vertebral arches are too delicate to be clearly observed. A delicate, curved, clavicular bone (*cl.*) occurs behind the opercular apparatus, but there are no traces of the pectoral fins. The remains of the pelvic fins are also too imperfect for description; but the anterior rays of the short dorsal, slightly further back, are beautifully shown. The foremost ray seems to have been undivided, and is two-thirds as long as the second. This also is not forked, but appears to have been articulated at moderately wide intervals in the distal portion. The third, fourth, and fifth rays not only exhibit distant articulations, but also bifurcate twice in the distal portion. The hinder rays are imperfect, the bases only of three being preserved. The anal fin-supports are very short in proportion to the length of the rays, and do not interdigitate with the more slender hæmal arches, which are inclined to the axis of the body at a much more acute angle than they. The foremost anal fin-ray is undivided and somewhat shorter than the next. The fifth ray exhibits one bifurcation, but the impressions of the others, so far as distinguishable, are simple. No scales can be seen.

Another specimen (Plate XVIII. fig. 2) displays the trunk especially well in impression, with fragmentary remains of the head. The articular end of the mandible (*md.*) is shown, with straight inferior border, very low articulation, and the ramus rapidly rising

to the coronoid region. The quadrate bone (*qu.*) is clearly thrust between the pterygoids as in the last specimen, and its thickened hinder border is preserved. An imperfect impression of the cranial roof (*c.r.*) seems to indicate a narrowing between the orbits. The characteristic operculum (*op.*), suboperculum (*s.op.*), and 12 branchiostegal rays (*br.*) are also imperfectly shown in impression. Of the vertebral centra only fragments are preserved in the abdominal region—nearly all are indicated in impression. The centra are very short and deep in the abdominal region and the anterior half of the tail, but relatively longer more posteriorly. Their sides are marked by fine longitudinal ridges, and the few centra preserved immediately behind the head are much laterally compressed by crushing, as if they were not well ossified. Eighty centra can be counted before they become as long as deep, and the impression of the hinder half of the tail is not quite clear. The neural and hæmal arches are extremely delicate, and much inclined backwards. There are no traces of the pectoral fins; but there are fragmentary remains of the pelvic pair and their supports entirely in advance of the dorsal fin. The latter arises about opposite the thirty-fifth vertebra and shows seven rays, with uncertain evidence of an additional one in front and behind. The distal bifurcations of the middle rays are preserved. The anal fin, extending about half the total length of the fish, arises nearly opposite the forty-ninth vertebra. Its rays are extremely numerous, but are not sufficiently distinct in the hinder part to be counted; the foremost rays are apparently thickened by the sliding apart of their right and left halves. Along the ventral border of the trunk there is a narrow streak in which a chain of scutes or abnormally developed scales can be recognized on parts of the caudal region (*l.*).

A third specimen in counterpart (Plate XVIII. fig. 3) exhibits the head and the greater portion of the trunk, with an especially conspicuous display of the ventro-lateral row of enlarged scales just mentioned. On one side of the fossil an impression of the cranial roof is distinct (*c.r.*) showing the truncated occiput, the nearly parallel sides of the otic region, and the slender rostral region, but none of the sutures. There is also some indication of an interorbital constriction, but this may possibly be a false appearance due to the crushing of the parasphenoid upon the roof. Traces of the striated suboperculum are distinguishable; and several branchiostegal rays occur on the opposite side of the specimen. The crushed, short, and delicate vertebral centra are distinguishable; and in the caudal region the almost filamentous neural and hæmal arches are observable, all much inclined backwards, and those at the hinder end of the fossil clearly inclined to the axis of the fish at a much more acute angle than the short supports of the anal fin. The remains of only six rays are shown in the dorsal fin. The pelvic pair are crushed together and imperfectly seen from above or below; about twelve rays can be counted in the patch they form. The precise characters of the enlarged scales of the conspicuous ventro-lateral series (*l.*) cannot be determined, but some appear to



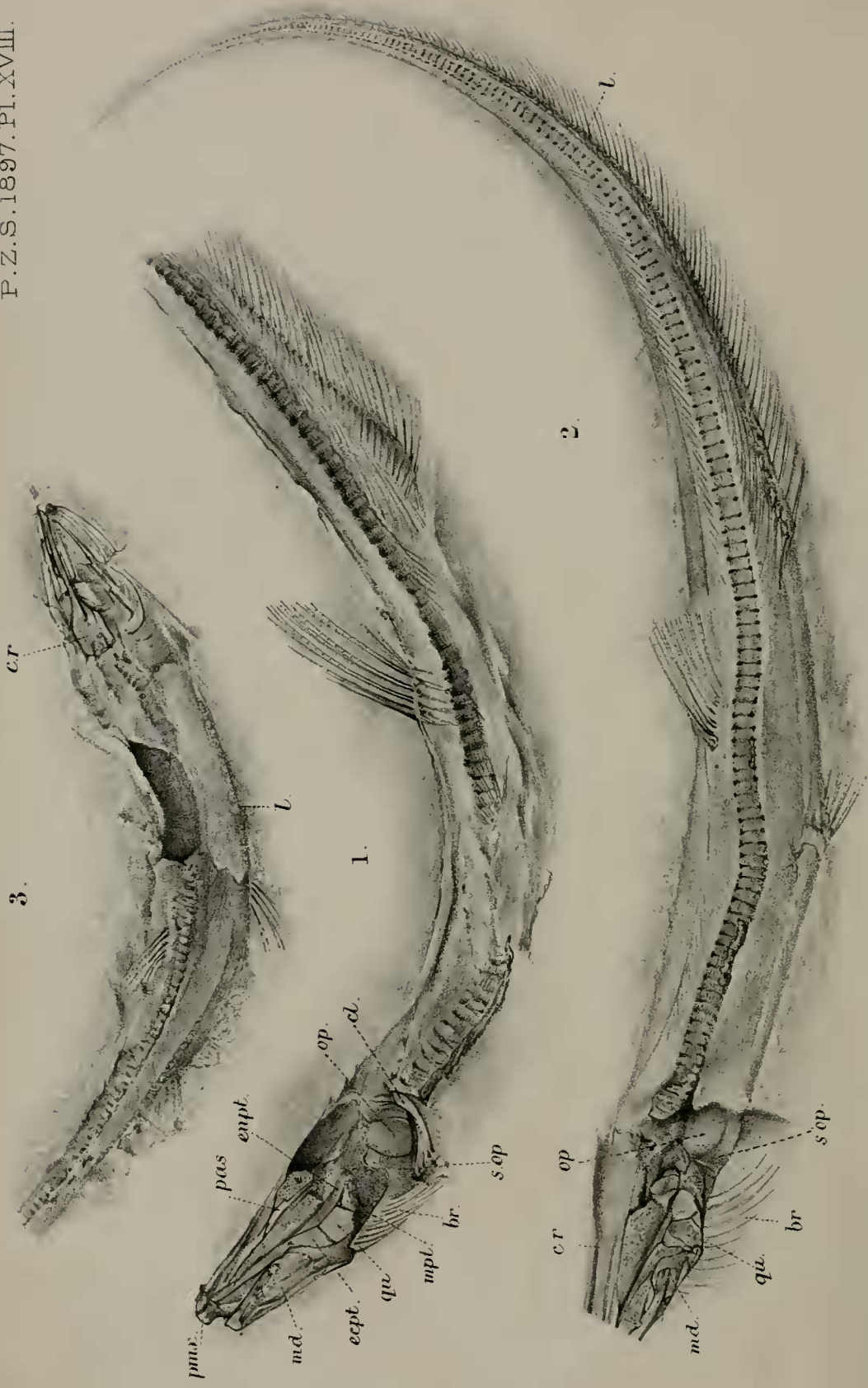


exhibit traces of a longitudinal ridge or angulation. No other scales are preserved.

The fourth and last specimen in the British Museum (no. P. 2114) is preserved on a slab with remains of other fishes. Part of its soft tissues are shown in places as a blackened film, but, like the other specimens, it exhibits no clear indication of scales. The low cranium is observable in broken longitudinal section, while there are imperfect impressions of the characteristic pterygoquadrate arcade and opercular apparatus. There are also impressions of ten very slender and widely-spaced branchiostegal rays. Immediately behind these occurs the clavicle, but no pectoral fin. The vertebræ are well shown, of the form and character already described. The delicate ribs are very short, apparently not reaching more than halfway to the ventral border; and there seem to be long and slender intermuscular bones crushed across the neural arches both in the abdominal and caudal regions. One of the pelvic fins exhibits six rays, all except the foremost divided in the distal half; its support is longer than broad and tapers to a point in front; it is shown in the impression. Six rays are well preserved in the dorsal fin, and there may have been one or two more beyond. The first of these rays is simple and a little shorter than the others; the second is also simple, but slightly longer and with distant articulations; the third is the longest ray, while this and the other three are once bifurcated distally. The anal fin is imperfect at its free border, and the end of the tail is wanting.

So far as the characters of *Echidnocephalus* are shown by these specimens, the Cretaceous fish only appears to differ from the Recent *Halosaurus* in three particulars: no scales are observable in the British Museum fossils except along the sensory canal of the "lateral line": no pectoral fin is distinguishable; and the number of rays in the dorsal and pelvic fins is less than is usual in the existing genus. The first two of these differences, however, may be due to imperfections in preservation; and Dr. von der Marck has indeed mentioned¹ that some specimens exhibit very delicate scales, covering the whole of the trunk. The third point is comparatively insignificant. Other differences may still be discovered in the characters of the facial bones and dentition, which remain unknown; but, in any case, it will be realized that in all essential features the Halosauroid type of fish is one of great antiquity.

EXPLANATION OF PLATE XVIII.

Figs. 1-3. *Echidnocephalus troscheli*, W. von der Marck.—Upper Cretaceous (Senonian); Sendenhorst, Westphalia. *br.*, branchiostegal rays; *c.r.*, cranial roof; *cl.*, clavicle; *ecpt.*, ectopterygoid; *enpt.*, entopterygoid; *l.*, enlarged scales of "lateral line"; *md.*, mandible; *mpt.*, metapterygoid; *op.*, operculum; *pas.*, parasphenoid; *pma.*, premaxilla; *qu.*, quadrate; *s.op.*, suboperculum.

[The figures are of the natural size, and the original specimens in the British Museum are numbered respectively P. 2111, P. 4481, P. 5949.]

¹ *Paleontographica*, vol. xv. (1868), p. 288; *ibid.* vol. xxii. (1873), p. 62; and *ibid.* vol. xxxi. (1885), p. 260.

2. On a Specimen of *Acanthocybium solandri* from the Arabian Sea. By G. A. BOULENGER, F.R.S.

[Received January 30, 1897.]

The Trustees of the British Museum have recently received from their enthusiastic and generous correspondent at Muscat, Surgeon-Lieut.-Col. Jayakar, C.M.Z.S., a specimen of a pelagic¹ Scombroïd (*Acanthocybium solandri*), of which half a dozen specimens at the outside are known to be preserved in museums, and of which nothing but a dried head from the Atlantic, presented by Prof. Lütken, was until now in the National Collection.

The specimen is further of interest as affording the first record of this fish in the Indian Ocean.

The species was originally described by Cuvier and Valenciennes as *Cybiium solandri*, from a MS. description and figure by Solander, taken from a specimen observed in 1769 about the Pomotu Archipelago, South Pacific Ocean, which figure has since been reproduced by Günther in his 'Fische der Südsee.' The specimen was 4 ft. long, and the radial formula is given as: D. 26+11+IX; A. 12+X; C. 33; P. 22; V. 1/5.

Shortly after, in 1839, the same fish was redescribed, under the name of *Cybiium sara*, by Bennett, from notes and a sketch taken by Surgeon Collie of a specimen about 4½ ft. long observed at the Loo Choo Islands. Radial formula: D. 25+?+IX; A. ?+IX. This *C. sara* became, in 1862, the type of Gill's genus *Acanthocybium*, a genus which, as Lütken has shown, is fully entitled to recognition. Dr. Günther has since referred the species to the synonymy of *C. solandri*, a fact which Vaillant appears to have overlooked when redescribing it in 1885, from a specimen of unknown origin preserved in the Paris Museum (D. 25+11+VIII; A. 12+IX).

A very similar fish was described by Poey in 1860 as *Cybiium petus*. This was said to be not uncommon off Cuba, growing to a length of 5 ft., but, owing to its large size, specimens were not preserved, and it was described from notes and sketches made on a fresh specimen. D. 23+12+VIII; A. 12+IX. *C. petus* is referred by Lütken to the synonymy of *C. solandri*.

The same species appears once more under a new name in 1872, when Doderlein gives a detailed description of it, accompanied by an excellent figure, as *Cybiium verany*, from off the coast of Sicily. D. 26+12+VIII-IX; A. 12+IX-X; P. 24; C. 1/5. This is also regarded as a synonym of *C. solandri* by Lütken, who states that specimens up to 7 ft. long are occasionally captured in the Atlantic, north and south of the Equator, heads and tails only being preserved. Jordan mentions it as 'not very common' about the Florida Keys; a single specimen was taken at Key West. D. 25+12+IX; A. 13+IX.

In the work quoted above Günther has also reproduced a figure,

¹ Rightly regarded as such by Lütken, although not included in Goode and Bean's 'Pelagic Ichthyology.'

made by Garrett from a specimen 3 ft. long, obtained in the South Pacific, 300 miles north of the Hervey Islands. The differences observable on comparing this figure with that of Solander are probably due to the imperfection of the drawing. D. 25+10+VIII; A. 11+VIII.

The synonymy of *Acanthocybium solandri* would therefore be as follows:—

1831. *Cybiium solandri*, Cuv. & Val. Hist. Poiss. viii. p. 192.
 1839. *Cybiium sara*, Benn. in Beechey, Voy. 'Blossom,' Zool. p. 63, pl. xx. fig. 2.
 1860. *Cybiium petus*, Poey, Mem. Cuba, ii. p. 234, pl. xvi. fig. 1.
 1868. *Acanthocybium petus*, Poey, Repert. fis. Cuba, ii. p. 363.
 1872. *Cybiium verany*, Doderl. Giorn. Sc. Palermo, viii. p. 125, pl. iv. fig. 2.
 1876. *Cybiium solandri*, Günth. Fische d. Südsee, p. 153, pl. xciv.
 1879. *Acanthocybium peto*, Poey, Proc. U. S. Nat. Mus. i. p. 5.
 1880. *Acanthocybium solandri*, Lütke. Spol. Atlant. i. pp. 71 & 189.
 1884. *Acanthocybium solandri*, Jordan, Proc. U. S. Nat. Mus. vii. p. 119.
 1885. *Cybiium sara*, Vaill. Bull. Soc. Philom. (7) ix. p. 21.

I append a short description of the specimen, preserved as a skin $3\frac{1}{2}$ ft. long, obtained at Muscat by Mr. Jayakar.

D. 25+13+IX; A. 11+IX; P. 25; V. 6.

Depth of body 7 times in total length, length of head $4\frac{2}{5}$ times. Eye 8 times in length of head, 4 times in length of snout, twice in interorbital width; præmaxillary extending to below anterior border of eye, with about 50 teeth on each side, its beak-like anterior portion equalling its distance from the eye; chin pointed, slightly projecting. First dorsal a little longer than second, originating above base of pectoral; spines subequal, $\frac{1}{4}$ length of head, a little longer than longest rays of second dorsal, from which it is separated by a space equal to $\frac{1}{5}$ length of head; second dorsal a little in advance of anal. Pectoral not quite half length of head; ventral $\frac{3}{5}$ length of pectoral. Lateral line descending in a curve below the second third of the anterior dorsal, terminating on the tail in a strong keel which is as long as the postorbital part of the head. Uniform dark olive above, pale golden on the sides and below.

3. Remarks on the Existing Forms of Giraffe.

By W. E. DE WINTON, F.Z.S.

[Received January 30, 1897.]

There seems to be some doubt among naturalists in regard to the specific relations of the Giraffes of Nubia and the adjacent countries to those of Africa south of the Equator; the almost total absence of wild-killed specimens of the northern form during the last half-century until within the last year or two is no doubt

the reason for the nomenclature of the two species being left in a very unsettled state.

The exhibition of the skin of a Somaliland animal by Mr. Oldfield Thomas, on behalf of Messrs. Rowland Ward & Co., at a meeting of the Society on Feb. 20th, 1894, made me look into the literature on the subject. Since then the British Museum has been fortunate in augmenting the older material by heads of both species received from the actual collectors—Mr. H. A. Bryden having presented a head of the Southern form brought home by Kama, killed in the North Kalahari; and Mr. Arthur H. Neumann a head of the Northern form, killed a little to the east of the Loroghi Mountains and north of the Guaso Nyiro (about 1° N. lat.); besides which others have been acquired by purchase.

I must express my thanks to the authorities of the Museum for giving me every facility in examining the material in the National Collection. I have also had access to several specimens contained in private collections, and to the valuable collection of skulls in the Royal College of Surgeons, kindly placed at my disposal by Professor Stewart. That so few specimens of this extraordinary animal find their way to this country is no doubt due to the value set upon the hides in the countries where they are obtained, by the natives for making shields, and by the settlers for "sjamboks," or whips, the skin of the neck of a bull Giraffe standing second only to Hippopotamus hide in value. Besides, the absence of attractive horns does not commend the head in the eyes of sportsmen as a trophy of sufficient value to repay them for the trouble and expense of transporting such bulky material to the coast, so that all the more credit is due to those generous and patriotic hunters who have presented specimens to the National Collection.

At the meeting of the Society when the above-mentioned Somaliland specimen was exhibited, Mr. Oldfield Thomas pointed out the differences in the markings characteristic of the two forms; and in order to show that the Somaliland animal did not need description, as had been suggested, mentioned that Sundevall's name would apply to the specimen under notice, but, pending the arrival of a fresh wild-killed southern specimen to compare with it, purposely ignored the obvious fact that Linnæus's name applied solely to the northern form.

Etienne Geoffroy St.-Hilaire (Ann. Sci. Nat. 1827, p. 222) was the first to mention any distinction between the Northern and Southern Giraffes, but seems never to have fulfilled his promise to describe the two forms further and to give them specific names, though he gives a plate of the skull of the "Giraffe du Cap."

Fischer (Syn. Mamm. 1829, p. 456) mentions this fact thus: "*Camelopardalin Sennaarenses a Capensi specie differere Geoffroy aliquo recentiores, notis tamen, quibus utraque distinguatur, nondum indicatis.*" This sentence may have been considered sufficient to constitute a naming of the two species, or perhaps, what is more probable, specimens of the two forms were labelled *sennaarensis*

and *capensis* in the Paris Museum, as these names have been attributed to Geoffroy, but no published diagnoses of them can be discovered.

Swainson (1835, Geogr. Class. Anim. part i. p. 95) calls the Northern Giraffe *Camelopardalis antiquorum*, and refers to the characters given by Rüppell as a foundation for this name. The Giraffe of Southern Africa is referred to as *C. australis*, but no description is given, nor is there any reference to the published plates, so that the name is a *nomen nudum*. A. Smith in his 'Report on the Expedition into the Interior of Africa 1834,' published in 1836, refers to the Giraffe of South Africa between the River Ka Gariep (Orange R.) and the Tropic of Capricorn as *Camelopardalis australis*, Sw.; but this cannot be called a diagnosis, so this name also falls as a *nomen nudum*.

Ogilby, in his paper on the "Genera of Ruminantia" (P. Z. S. 1836, p. 134), under *Camelopardalis*, says "*Duo species sunt C. æthiopicus et C. capensis*." Whence the former of these two names was derived I am unable to make out, but there was ample excuse for the author finding it necessary to provide fresh specific names for both species, as almost all authors since Gmelin had used Linnæus's specific name as the generic name, and *Giraffa*, which was given in the first place to the genus by Brisson (Regn. Anim., Dist. Quad. et Cetac. 1762, p. 37), could not be used specifically. Unfortunately Ogilby gives no diagnosis, and mentions no types for his species, so his names again must fall as *nomina nuda*. In the Transactions of this Society, 1838, Owen points out certain characters in the cranium of the "Cape Giraffe" as distinguishing it from the "Nubian Giraffe," and, although he had only young specimens of the latter form, seems thoroughly to have recognized the validity of the two species, but introduces no Latin names. Lesson (Nouv. Tabl. Règne Animal, 1842, p. 168) gives "1278, *Camelopardalis giraffa*, Gmel., Nubie et Sennaar"; and "1279. *Camelopardalis capensis*, Cap de Bonne Ésperance, la Giraffe Levail. Voy. pl. 8 & 9"; and so, in thus referring to a figure, must take the credit of having first proposed a tenable name for the Cape form.

Gray, in the 'List of the Specimens of Mammalia in the Collection of the British Museum,' 1843, p. 170, acknowledging but one species, under *Camelopardalis giraffa*, Gmel., gives as synonyms *C. sennaarensis* and *C. capensis*, Geoffr.; but, as shown above, these names had never been published or the forms described by Geoffroy.

Sundevall in 1844, K. Vet.-Akad. Handl. Stockh. p. 174, gives:—"*Camelopardalis giraffa*, Schreb., *unica species*. α . *in Africa meridionali, extra tropicum, colore paulo obscurior*.— β . *Æthiopica, e Sennuar, alba, fulvo-maculata, pilis brevissimis*."

Gray, 1852, Cat. Mamm. Brit. Mus. p. 180, gives one species, "*Giraffa camelopardalis*, L., with one variety ('paler'), *C. giraffa* β . *æthiopica*, Sundevall." It will be noticed that Gray here revives the original generic name and also uses the proper specific name given by Linnæus; and it seems quite unaccountable how

he could have overlooked the fact that the locality for the type species was given as Sennaar, and that the name applied primarily to the Northern form.

Thus the names have been accepted until quite lately, and though I have been well aware that they could not stand as they were, still I have put off publishing any remarks on this animal, hoping that it would be my good fortune to come across a specimen in some collection which might some day be entrusted to me for working out; but the necessity for the present communication is shown by the receipt of Mr. S. Rhoads's paper (Proc. Acad. Philad. 1896, p. 518), on the mammals collected by Dr. Donaldson Smith during his recent expedition to Lake Rudolf, in which a Giraffe is included.

Mr. Rhoads seems to have read the short notice of Mr. Thomas's remarks (P. Z. S. 1894, p. 135), and then, after having looked up Linnæus's description and found that *Æthiopia* was the locality given for the typical specimen, without reference to any of the authors above quoted, to have jumped to the conclusion that the Southern form must require a new name, and so proposed that of *Giraffa australis*. I have, however, shown that this name was not needed and that it will thus fall as a synonym. Mr. Thomas's description, having been based on the large male of the Cape form set up in the British Museum (collected by Mr. Burke for Lord Derby, by whom it was presented to the National Collection), designated the type of Mr. Rhoads's *G. australis*, in founding which the description was quoted—a quotation which, like Lesson's quotation of Levaillant's figures, alone saves the name from being a *nomen nudum*.

I will now give a short description of the two forms and point out as far as can be ascertained the distribution of each: it will be noticed that the range of the two species is entirely confined to the "Steppe Country" of Sir Harry Johnston's map of Sportsman's Africa.

I do not admit Mungo Park's brown species without spots, of the Western Sudan, or the equally mythical "white-spotted slender form 23 feet high" of Farini, reported from Lake Ngami; for thoroughly misleading facts on natural history, I think the latter writer is hard to beat.

GIRAFFA, Briss.

Giraffa, Briss. Regnum Animale, Quadr. et Cetac. p. 37 (1762).
Camelopardalis, Gmel. Syst. Nat. i. p. 181 (1788).

THE NUBIAN OR THREE-HORNED GIRAFFE.

GIRAFFA CAMELOPARDALIS (Linn.). (Figs. 1, 2, p. 280.)

Cervus camelopardalis, Linn. Syst. Nat. (10) i. p. 66 (1758);
Linn. Syst. Nat. (12) i. p. 92 (1766).

Giraffa camelopardalis, Zimm. Geogr. Gesch. ii. p. 125 (1780) (in

part); Less. Man. Mamm. p. 369 (1827) (in part); Flow. & Lyd. Mamm. p. 331 (1891) (in part) &c.

G. camelopardalis, var., Gray, Cat. Ung. B. M. p. 181 (1852).

Camelopardalis giraffa, Gmel. Syst. Nat. i. p. 181 (1788); Illig. Prodr. Syst. Mamm. p. 104 (1811); G. Fischer, Zoogu. Tab. Synopt. iii. p. 473 (1814); Desm. Nouv. Dict. H. N. p. 164 (1817) (in part); Is. Geoffr. Dict. Class. H. N. p. 355 (1825) (in part); Cretzschm. Zool. (Atl.) Rüpp. Reise nördl. Afr. p. 23, pls. 8, 9 (1826) (in part); Et. Geoffr. Ann. Sci. Nat. xi. p. 222 (1827) (in part); J. B. Fischer, Syn. Mamm. p. 455 (1830) (in part); Smuts, En. Mamm. Cap. p. 67 (1832) (in part); A. Smith, S. Afr. Quart. Journ. 1834, p. 184 (in part); F. Cuv. H. N. Mamm. (fol.) iv. pl. 332 (1842); Less. Nouv. Tabl. Règ. Anim. p. 168 (1842); Sundev. K. Vetensk.-Ak. Handl. Stockh. 1842, p. 243 (in part); Gray, List Mamm. Brit. Mus. p. 170 (1843) (in part); Fitzing. Abh. k. Ak. Wiss. Wien, 1867, p. 589; &c.

C. sennaarensis, Geoffr. (*vide* Gray)?

C. antiquorum, Swainson, Geogr. & Classif. Anim. p. 134 (1835), ex Cretzschm.

C. aethiopicus, Ogilby, P. Z. S. 1836, p. 134 (*nomen nudum*).

Nubian Giraffe, Owen, Tr. Z. S. ii. p. 217 (1838).

C. biturigum, Duv. Ann. Sci. Nat. (3) t. i. p. 47, pl. 2 (1844) (*vide* Forsyth Major, P. Z. S. 1891, p. 316).

C. giraffa, var. *aethiopica*, Sundev. K. Vet.-Ak. Handl. Stockh. 1844, p. 174.

"Northern form," Thomas, P. Z. S. 1894, p. 135; Matschie, Säug. Deutsch-Ost-Afr. p. 103 (1895).

The ground-colour varies from white to fawn; the dark polygonal markings vary from orange-red to red-chocolate, the edges being even and sharply defined; the spaces between the dark patches are generally narrower and always far more clearly defined in aged animals than in those of a similar age in the Southern species. The legs below the knees and hocks are white. The males have a third horn in the centre of the forehead just above the eyes, cylindrical, from 3 to 5 inches long; in the young animal this position is occupied by a prominent tuft of black hairs.

Inhabits Gallaland from the Tana River northward, Somaliland, Abyssinia, Kordofan, and probably ranges right across Africa to Senegambia, in suitable localities, from the Equator to about 15° N.

THE SOUTHERN OR TWO-HORNED GIRAFFE.

GIRAFFA CAPENSIS, Less. (Figs. 3, 4, p. 281.)

Giraffa camelopardalis, Zimmermann (in part); Lesson (1827) (in part); Gray (1852) (in part); Flower & Lydekker (in part); &c.

Camelopardalis giraffa, Desmarest (in part); Is. Geoffroy (in part); F. Cuvier (in part); Et. Geoffroy (in part); J. B. Fischer (in part); Smuts; A. Smith (1834); Harris, Ill. S. Afr. pl. xi. 1840; Gray (1843); &c.

Camelopardalis australis, Swainson, Geogr. & Classif. Anim. p. 95 (1835) (*nomen nudum*); A. Smith, Rep. Exped. Int. Afr. p. 40 (1836) (*nomen nudum*).

Camelopardalis capensis, Geoffr. (*vide* Gray)?; Ogilby, P. Z. S. 1836, p. 134 (*nomen nudum*); Lesson, Nouv. Tabl. Règ. An. p. 168 (1842); ex Levaillant, Voy. pls. 8 et 9.

Cape Giraffe, Owen, Tr. Z. S. ii. p. 217, pl. xl. (1838).

Giraffa australis, Rhoads, P. Ac. Philad. 1896, p. 518; ex "S. African form," Thomas, P. Z. S. 1894, p. 135.

The ground-colour varies from white to dull fawn, the dark blotches vary from dun to dark coffee-colour, always darker in the middle, the edges being broken and not sharply defined. The legs are spotted down to the hoofs. On the forehead there is a bump of flattened pyramidal form, larger in the males but never forming anything like a horn.

The young animal has very narrow clearly-defined white lines between the darker markings, forming a network of lines over the entire body, the dark patches receding with age.

Within the last half-century this species has ranged from the Orange to the Zambesi Rivers. Northward of this latter river on the eastern half of the continent, at least, no Giraffe is found for about 12 degrees; but north of the Rufigi River it again appears and continues through German East Africa, reaching westward to the shores of Lake Tanganyika, and occurring east of the Mau Escarpment and south of the Tana River in British East Africa.

There is no appreciable difference in size between the Northern and Southern forms of Giraffe; both species vary much in the shades of colouring; the very old males or "Stink Bulls" (a name given to them from their exceedingly rank and powerful smell) of both species are described by all hunters as being always unmistakably darker than any others of a herd.

Mr. Arthur Neumann has kindly lent me the skin of a foetus taken from a female killed in South Africa, and this shows that the young animal very closely resembles the typical colouring of the adult of the northern species. Mr. F. C. Selous tells me that the calf is always a light brown, with a network of narrow clearly defined white lines separating the dark markings. This is the description I noted down of the young female captured on the Sabi River, when it first arrived at the Zoological Gardens; a very accurate figure of this animal will be found in 'The Field' of March 9, 1895. This animal is still alive and has not yet lost these characters, though the white markings are rather broader and the dark markings less evenly cut. The colour of the dark markings of this 3-year-old animal is coffee-brown, with a still darker irregular pattern in the centre of each patch, thus not at all light-coloured as would be supposed. This quite backs up Mr. F. V. Kirby's opinion; 'In Haunts of Wild Game,' he says that he feels confident that the animals vary individually and do not darken with age as generally supposed, for one sometimes sees young animals dark-coloured, and unquestionably old animals of a very pale colour.

Therefore it will be seen that with the material I have been able to collect, some dozen skins¹ and 13 skulls of both species of all ages, I cannot give more than a general outline of colouring. The adult Southern Giraffe has the general effect of a dirty white animal covered with brown blotches, with wider light spaces between them, the lower legs mottled, and upper face grizzled. The adult Northern Giraffe has clearly defined polygonal patches, the light intervening spaces narrower, the lower legs white and upper face roan.

The figures of the heads (pp. 280, 281) are faithfully drawn from specimens presented to and now in the British Museum—that of the Three-horned Giraffe from a young bull obtained by Mr. Arthur Neumann a little to the east of the Loroghi Mountains, and that of the Two-horned Giraffe from an animal of about the same age obtained by Mr. H. A. Bryden in the North Kalahari district. It will be seen that the horns of the northern species are longer, more massive, and slope backwards more than those of the southern species. I have never seen the two horns of equal length in either species.

I need hardly mention the fact that both species of Giraffe have six molariform teeth in each jaw, in common with all the Pecora (excepting the Spring Buck, *Gazella euchores*) of South Africa. Dr. Matschie in his recent work on German E. Africa says that there are only five molars in each jaw. This might lead to the idea that the German E. African Giraffe was of a different species, whereas I have shown that it is *G. capensis*, as Dr. Matschie, indeed, has quite clearly stated is his opinion also; but I think it well to mention this obvious misprint in the only book on the Mammalian fauna of East Africa yet published.

The skull of the male *G. camelopardalis* can of course be at once distinguished by the prominent third horn, and the skull of the female of the same species has no unossified space on the side of the face in front of the orbit, while there is a vacant space of considerable extent in the skull of the female of *G. capensis*; there is no vacant space in the skulls of old males of either species, and, so far as I can discover, no "outer protrusion of the superior spongy bone," as Owen says, but the true outer bones of the face meet and are joined by sutures. The palate of the southern species ends posteriorly in a projecting point in the middle line, while that of the northern form is rather narrower and rounded; the space between the pterygoid and the back of the upper jaw or last molar is also wider in the southern form, and the skull generally rather broader in proportion to its length; the distance from the back of the palate to the foramen magnum is slightly greater and the base of the brain-case is not so much bent down: thus in the northern form the angle formed by the basifacial and basicranial portions of the skull is more acute; this character is more marked in comparing skulls of moderately young animals.

¹ Since writing the above Messrs. Rowland Ward & Co. have shown me about a dozen scalps and neck-skins of the southern form, and they all show the same characters, though the light intervening spaces vary in width.

Fig. 1.

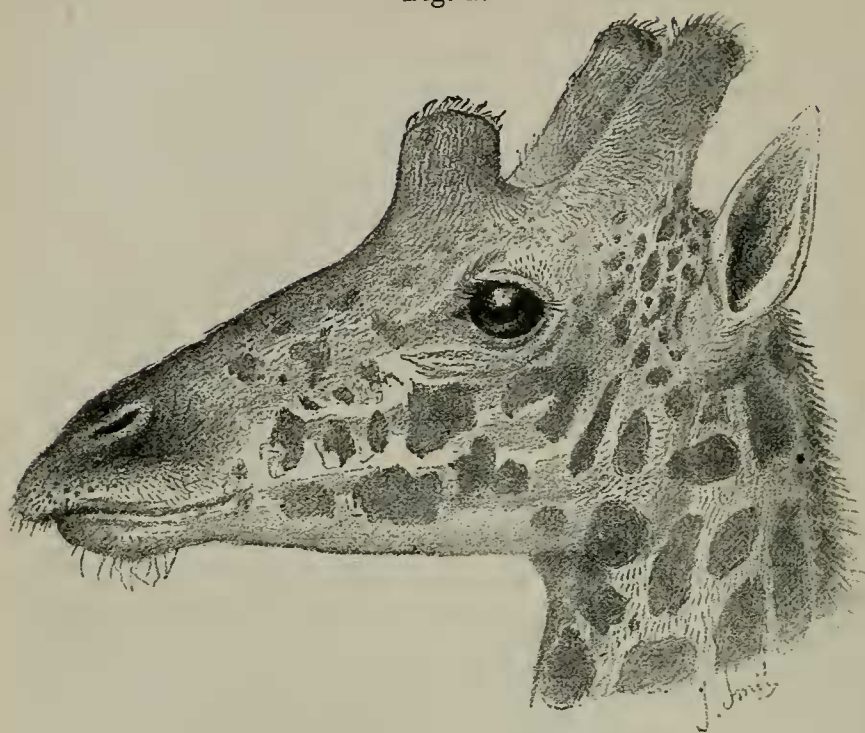
Head of *Giraffa camelopardalis*.

Fig. 2.

Skull of *Giraffa camelopardalis* (side view).

Fig. 3.

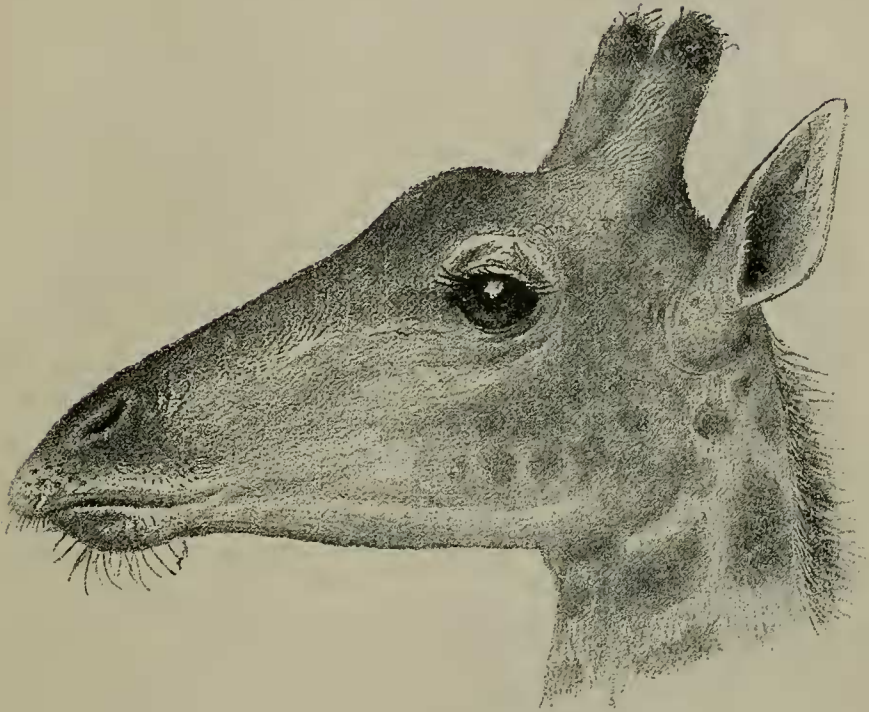
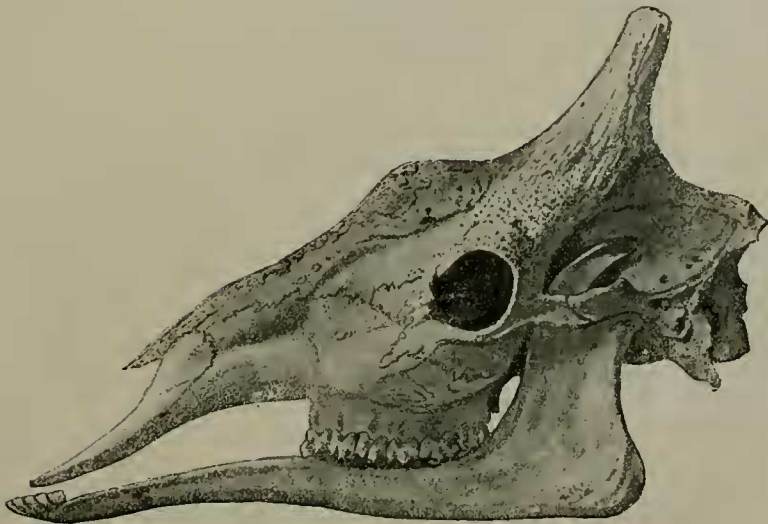
Head of *Giraffa capensis*.

Fig. 4.

Skull of *Giraffa capensis* (side view).

The figures of the skulls (pp. 280, 281) are taken from those of old wild-killed bulls now in the British Museum, the one from Abyssinia and the other from S. Africa.

Mr. Selous tells me that he has never seen a bull Giraffe with a third horn in South Africa, and Mr. Neumann says the same.

Noticing the great difference in the weight of the skulls of the two sexes, I was curious to put them on the scales: taking the dried skulls of two wild-killed Abyssinian animals, I found that of the male weighed 19 lb. 8 oz., while that of the female only weighed 7 lb. 6 oz. The bones of the skull of the female are very smooth and thin; the whole of the upperside of the skull of the male is covered with a rough superficial osseous growth, which has its centre in the three horns, gradually enveloping the whole of the upper parts of the skull, forming lumps on the supraoccipital and supraorbital bones, and covering the face to the end of the nasals and the cheeks, so that all the true bones are completely hidden.

Mr. Arthur H. Neumann—to whom I am much indebted for loan of specimens and help in working out the distribution, being well acquainted with the two forms, is perhaps the only hunter who has killed the Two-horned Giraffe both in South and East Africa, and also the Three-horned species, having formerly killed Giraffes in South Africa when they were much more plentiful than they now are and extended farther southward—tells me that on a journey from Mombasa as far as Usoga, on the route to Uganda, none were noticed but the southern or blotched kind, and that no Giraffes were seen west of the Naivasha Valley, the route taken from Naivasha to Kavirondo being more southerly than that at present followed by caravans. And writing to me on his recent successful hunting expedition to the northern shores of Lake Rudolf, Mr. Neumann says:—"I only observed the southern variety in the neighbourhood of Athi or Sabaki River; I had a good view of one a little south of that river. The northern species I found from the Tana River northward as far as I went, namely, to the north end of Bassu (Lake Rudolf); I mean, of course, the kind with the defined polygonal pattern. Whether or not there are any of this kind south of the Tana I do not know; but I feel sure that in the direction I went it is the only sort to the north of that river. In some parts, particularly about the Guaso Nyiro, it is very plentiful, far more so than I have ever seen the southern type anywhere. From a little north of the Loroghi Mountains, I met with no more Giraffes until near the north end of the lake, where I noticed a few in one locality."

Now Mr. Neumann has thus proved that the two forms are not separated by any impassable mountain district or any great river, but that they approach one another on ground much less geographically or climatically distinct than parts within the ranges of either. This proves that there is no intermediate form, and therefore that to both must be given full specific rank. I must leave it to geologists to give a reason for this abrupt breaking off of the species; it is the more interesting as it marks the southern limit to the range of Grevy's Zebra (*Equus grevyi*), while it does not prevent

the smaller Grant's Zebra (*E. granti*) [which I described (Ann. Mag. N. H. ser. 6, vol. xvii. p. 319, 1896) and named in honour of Colonel Grant, who always persisted in its being specifically distinct from the S. African Chapman's Zebra (*E. chapmani*)] from ranging northward and herding with its larger cousin.

Unfortunately one gets no help from the pictures of the Giraffes in books of travel, for, excepting a photograph of a dead bull in Mr. J. G. Millais's 'Breath from the Veldt,' I know of no authentic pictures of wild animals, and this is only of one specimen and cannot show the general colouring of a herd. In the same way pictures in other books are taken from some single specimen, maybe living in the Zoological Gardens. One animal that the hunter is paying his particular addresses to may be coloured darker than the rest to represent the old bull, according to instructions given to the artist, but the whole herd has the unmistakable stamp of being drawn from a single specimen. I do not in any way speak disparagingly, but only regret that it must needs be so.

The fact that the young of the southern species resembles the adult of the northern animal, seems to point to the presumption that the former is descended from the latter; but how are we to account for the third horn in the older form, for this appendage is not found in any of the known fossil *Giraffidee*? It seems, therefore, to have been acquired in recent times, but is hardly likely to have been established since the southern form got separated; and, if not, the alternative is that the latter form has since its separation entirely lost this apparently useless ornament. I cannot believe that the third horn of the northern Giraffe is so modern an acquisition, and I would much rather look upon it as the remains of a former development, for we may yet find an extinct form with this appendage equally or even more developed, and thus the superficial osseous incrustation of the skull of the males above referred to, formed by a superabundance of matter in the horn-core, may be all that is left of a much greater horn-development in some prior form. It is quite possible to imagine a very slight modification which would cause this matter to develop into external horns or antlers.

With regard to the possible use of this massive head, I was anxious to find out whether the horns are used in fighting. Mr. Neumann says of the Three-horned species the nearest thing to fighting he has seen was two young males playfully butting one another with their heads; he has seen Giraffes pressed by dogs keeping off their pursuers by kicking with their *hind feet* in rather a cowish fashion. Mr. Selous, on the other hand, says he once witnessed the following very pathetic incident:—a newly-born calf lying in the grass was seized by two Leopards, the mother Giraffe at once coming to the rescue fought with such effect with her *fore feet* that she succeeded in driving off the Leopards, but, unfortunately, one blow aimed at the Leopard struck the calf in the back, breaking it. On seeing this the hunter went up and put the poor little beast out of its misery. All hunters agree that the Giraffe never uses its head in self-defence.

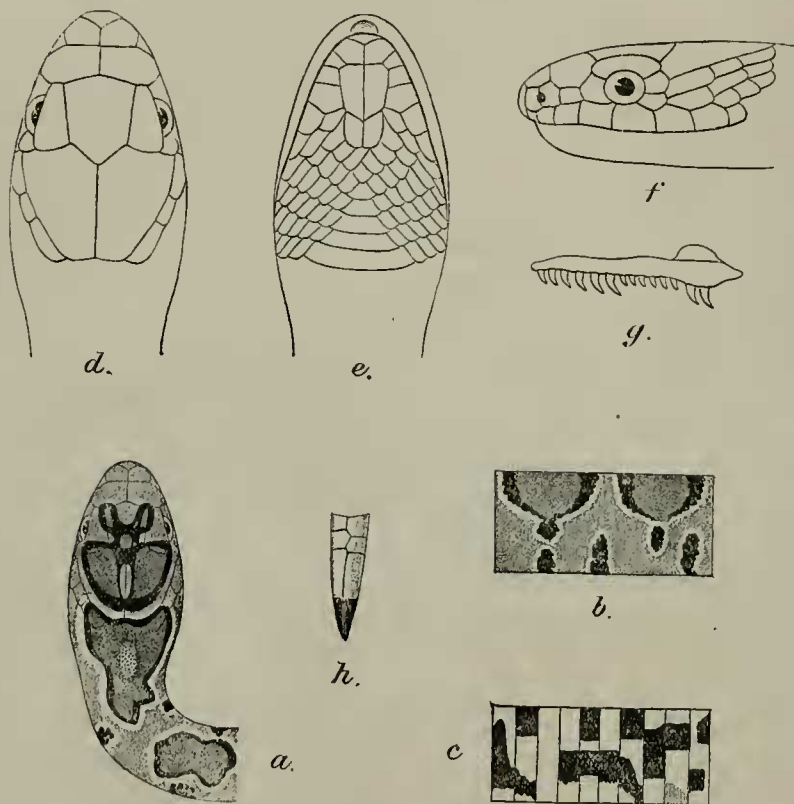
4. Description d'un Ophidien nouveau du Mexique (*Oreophis boulengeri*, g. et sp. nn.). Par ALFRED DUGÈS, M.D.

[Received January 29, 1897.]

Ce petit serpent est très rare à Guanajuato ; après plus de 40 ans d'existence dans cette ville, c'est le premier exemplaire que je vois. Il provient des montagnes voisines, à plus de 2000^m d'altitude, où les hivers sont très froids (Sierra de Santa Rosa).

L'alcool avait déjà décoloré en partie cet ophidien, mais pas assez pour qu'on ne put voir encore des traces des couleurs fraîches.

Dimensions. Tête, 0^m,017 ; tronc, 0^m,31 ; queue, 0^m,06 ; total, 0^m,387.



Oreophis boulengeri.

- a. Tête et cou, vus en dessus. b. Tronçon du corps, vu de côté. c. Le même, vu en dessous. d, e, f. Tête, vue en dessus, en dessous, et de côté, grossie. g. Maxillaire, grossi. h. Bout de la queue, grossi.

22 rangs d'écailles lisses, rhomboïdales, avec un pore apical. Gastrostèges 185. Urostèges doubles 44. Anale indivise. Supralabiales 8. Sous-labiales 9, dont 4 sont en contact avec les infra-maxillaires. Les deux pré-généales (inframax. antérieures) sont presque doubles de grandeur des postérieures. Nasale divisée. Une petite frénale plus longue que haute. Une préoculaire et

deux postoculaires. Temporales 2+3. La préoculaire ne touche pas la frontale.

Le corps est en dessus gris très finement pointillé; en dessous il conserve une teinte rougeâtre sans doute plus vive à l'état de vie. Le ventre porte de nombreuses taches noires, quadrilatères, irrégulièrement distribuées. Une fourche brune naît sur la frontale et étend ses branches un peu sur les suroculaires et les préfrontales postérieures. Un croissant rouge bordé de noir couvre en grande partie les pariétales et l'extrémité postérieure des suroculaires; au milieu il est divisé par une bandelette longitudinale noire, au centre de laquelle on voit un point blanc. Sur l'occiput et le cou s'étend un triangle (dont la base, qui est antérieure comme la partie concave du croissant, est excavée) rouge bordé de noir, portant au centre un ovale plus clair, bordé et tiqueté de noir. Sur le reste du corps, la queue incluse, il y a 40 taches rouges dilatées en travers et bordées de noir. L'extrémité de la queue est noire, et constituée par un étui corné sillonné en dessous. Sur les flancs on observe de petites taches noires, souvent opposées aux taches du dos, et des raies verticales noires. Toutes ces taches du dos et des flancs, ainsi que le triangle nuchal, sont entourées d'un liseré blanc.

14 dents au maxillaire. Les dents antérieures de cet exemplaire sont en partie cassées, mais leur base indique qu'elles sont grandes et fortes; les suivantes sont courtes et plus rapprochées entr'elles, et les 2 ou 3 dernières, non séparées, sont de nouveau plus grandes. La petitesse des dents moyennes distingue le genre *Oreophis* du genre *Coronella*, dont il est très voisin.

Je dédie cet élégant ophidien à mon collègue M. Boulenger, que je prie d'accepter cette bien légère marque de mon estime.

5. On the Dates of the Natural History portion of Savigny's 'Description de l'Égypte.' By C. DAVIES SHERRIN, F.Z.S.

[Received February 4, 1897.]

The dates of the various portions of Savigny's 'Égypte' have always been very obscure. The following notes are offered as affording an approximation to the dates, and as an assistance to those who may attempt in future to solve the mystery of them.

The various portions will be taken seriatim:—

VOL. I., part 1, "*Poissons du Nil*" by Geoffroy, pp. 1-52: was reviewed in the *Gött. gelehr. Anz.* (1811), p. 1234. It formed part of Livr. 1, which was published in **1809**. See also Férussac, *Bull. Sci. Nat.* 1830, p. 319. There is a copy in the Gray Tracts, Brit. Mus. (Nat. Hist.), which bears an imprint of 1810.

VOL. I., part 1, "*Oiseaux de l'Égypte et de la Syrie*" by J. C. Savigny, pp. 63-114: was reviewed in the *G. g. A.* (1811),

p. 1234. A separate copy in the Tweeddale Library, Brit. Mus. (Nat. Hist.), has on the title 1810, and includes "Observations sur le système des Oiseaux de l'Égypte," dated 5 Dec., 1810, and "à Paris de l'imprimerie impériale, 1811." There is also a footnote on A2 "Le premier ordre de ce système a paru en 1809, dans la première livraison de l'ouvrage général." There is no doubt that Livr. 1 appeared in 1809 and that the "Oiseaux" formed a part of it: therefore the date is **1809**.

VOL. I., part 1, "*Reptiles*" by Geoffroy, pp. 115-120: by Isidore Geoffroy, pp. 121-160: explication des planches des Reptiles, by V. Audouin, pp. 161-184.

"*Crocodiles*" by Geoffroy, pp. 185-264.

"*Suite des Poissons du Nil*" by Isidore Geoffroy, pp. 265-310.

"*Poissons de la Mer Rouge*" by Isidore Geoffroy, pp. 311-343.

I take these parts all together. The *Reptiles* of Etienne Geoffroy was completed by his son Isidore, and an explanation of the plates was given by Audouin. The *Suite des Poissons* and the *Poissons de la Mer Rouge* were reviewed in Férussac's *Bulletin* (xx., 1830, p. 319) as having recently appeared. Isidore Geoffroy, writing in Du Petit Thouars's 'Voyage de la Vénus' (Mamm. p. 2, f.n.), says: "Dans les parties erpétologique et ichthyologique du grand ouvrage sur l'Égypte, 1827." In the 8vo edition of Savigny, the Reptiles, Fishes, and Crocodiles occupy vol. xxiv., which was published in 1829; while it is certain that many of the *explications des planches* of Audouin were published in 1826.

In Férussac, *Bull. Sci. Nat.* xix., 1829, p. 336, and xx., 1830, pp. 147 and 319, the two volumes of Natural History of Egypt are reviewed. Georges Cuvier dated his preface to the 2nd edition of 'Le Règne Animal,' Octobre 1828, at which date we may with safety assume that his work was finished. He was the most likely person to see the 'Histoire Naturelle de l'Égypte'; and an examination of his volumes shows that, though he was familiar with the *plates*, he had not seen the whole of the text by the date he wrote his preface. Unfortunately Cuvier frequently omitted to quote more than the plate in his references, and this makes our enquiry more difficult. So far as Mammals are concerned, Cuvier quotes thrice only (pp. 115, 119, and 120), but these quotations do not settle anything. In Vol. ii. of 'Règne Animal,' dealing with Reptiles and Fishes, he quotes the work many times, and notably the *text* of the "Crocodiles" on p. 22. Now as the "Crocodiles" formed pp. 185-264 of Vol. I. of 'Hist. Nat. de l'Égypte,' we may conclude that pp. 115-264 of that volume, which included the Reptiles, were published before October 1828; and, accepting Isidore Geoffroy's statement in the *Voyage* of the *Venus* (*supra*) as correct, definitely fix the date as **1827**. The Fishes also, which form pp. 265-343 of the Vol. II. of the 'Hist. Nat. de l'Égypte,' are quoted only as plates by Cuvier in his 'Règne Animal.' In Cuvier and Valenciennes's *Hist. Nat. Poissons*, i., 1828, pp. 198, 199, Cuvier refers to the work as follows:—

"M. Isidore Geoffroy, son fils, vient de donner de ces descriptions une rédaction générale qui le présente avec ordre et clarté." It seems, therefore, that **1827** also is the correct date for this part of the Fishes.

VOL. I., part 2, *Asciidiens* by J. C. Savigny, pp. 1-58.

The date of this part is of no consequence, as all the specific names were issued by Savigny in 1816.

VOL. I., part 3, *Annelids* by J. C. Savigny, pp. 1-128. This was reviewed in the *Gött. gelehr. Anz.* (1827, p. 695). Engelmann, *Bibl. Hist. Nat.* p. 550, gives the date as 1820, but the review quoted above leaves little doubt that **1822** is the correct date.

VOL. I., part 4, *Explication des Planches* by V. Audouin. These consist of *Mollusca* (pp. 7-56), *Annelids* (57-76), *Crustacea* (77-98), *Arachnids* (99-186), *Insects* (187-202), *Echinoderms* (203-212), *Zoophytes* (213-214), *Ascidians* (215-224), *Polypes* (225-244), *Oiseaux* (251-318). Engelmann, *Bibl. Hist. Nat.* p. 340, says that the *Moll.*, *Ann.*, *Crust.*, *Arach.*, *Ins.*, *Echin.*, and *Ascid.* were issued as fo. *Paris*, 1826. On p. 550 he says the descriptions of the *Arachnida* appeared fo. *Paris*, 1812; a statement quite inexplicable to me and considered by me as a mistake. F. S. Leuckart, 'Breves Anim. quorundam,' 1828, p. 15, refers to the plates of the *Gasteropoda* as 1812; and it may be that Engelmann's reference refers to the plates, and not the descriptions, of the *Arachnida*.

At the beginning of part 4 of Vol. I. there is a letter dated 19 Mars 1825, stating that the work of finishing had been entrusted to V. Audouin on account of the ill-health of Savigny. This is conclusive. See also *Ann. Soc. Entom. France*, xi., 1842, p. 99, where it is definitely stated that in 1826 the Government selected Audouin to give the descriptions to the plates of *Mollusca* and articulated animals. Dr. John Anderson tells me that he has ascertained that Savigny's sight failed him¹, and that no manuscripts of any kind were handed over to Audouin, so that Audouin had to begin *de novo*.

In the Reprint of the *Oiseaux* by the Willughby Society, the editor comes to the conclusion that it was published "not earlier than 1826."

In the 8vo edition of Savigny's 'Égypte,' the portion of the Natural History under consideration occupies vols. xxii. 1827, and xxiii. 1828.

Férussac, *Bull. Sci. Nat.* xix., 1829, p. 336, and xx., 1830, pp. 147 & 319, may be consulted with advantage.

I have no doubt myself that all the parts enumerated above may be safely regarded as dated **1826**.

VOL. II. *Mammifères* by Geoffroy, pp. 99-144. This is reviewed

¹ F. Caillaud, *Voy. à Meroë*, iv. 1827, p. 271.

in the *G. g. A.* (31 July 1819, p. 1203). *Mus cahirinus* is quoted, without page, in *Nouv. Dict. Hist. Nat.* xxix., 1819, p. 70, and *Rhinolophus tridens* on p. 253 (but in the latter instance the page of the text of Geoffroy's 'Égypte' is quoted). *Ichneumon edwardsii*, *I. gersius*, and others are also referred to by pages, on pp. 212 etc. of the same work. I regard this part as issued in **1818**. There is a very interesting proof of pp. 99–144 preserved in the Gray Tracts, Brit. Mus. (Nat. Hist.). It is paged 1–46 and has for signature 7 *H. N.*, and is dated 'l'Imprimerie impériale, Mars 1813.' This was sent by Geoffroy to Dr. J. E. Gray, and in a letter which accompanies it, *without date*, Geoffroy says:—"Je lui fais part dans cette livraison d'un imprimé tiré dans cette forme à deux exemplaires, et c'est la seule considération que je sais faire valoir pour rendre moins indigne de lui ce faible don de ma reconnaissance." Engelmann, *Bibl. Hist. Nat.* 1846, p. 373, quotes 1813.

VOL. II., *Mammifères* by Geoffroy and V. Audouin, pp. 733–743, and *Mammifères carnassiers* by V. Audouin, pp. 744–750. In Férussac, *Bull. Sci. Nat.* xix., 1829, p. 337, there is a footnote which states "La partie de l'ouvrage qui contient ce mémoire et le suivant [*i. e.* 'Mammifères' and 'Mammifères carnassiers'] vient seulement de paraître." This seems to be conclusive, and the date of these two parts may be accepted as **1829**.

VOL. I., part 1, pp. 53–62; VOL. I., part 4, pp. 245–250, and VOL. II., pp. 1–98, deal with Botany and Mineralogy, and do not come under this enquiry.

I am indebted to Mr. Boulenger, Dr. Anderson, and Mr. B. B. Woodward for many valuable suggestions during the progress of this enquiry, which has extended over several years.

6. Notes upon the Anatomy of *Phaethon*. By FRANK E. BEDDARD, M.A., F.R.S., Prosector to the Society.

As the genus *Phaethon* is one of the least known among the Steganopodes, and as it is regarded by Fürbringer as the most primitive form of that group, I am particularly grateful to Mr. J. J. Lister, of St. John's College, Cambridge, for allowing me to dissect a specimen.

I identify the specimen (a ♀) with *Phaethon flavirostris* of Brandt¹, as described by Mr. Lister in a paper upon the fauna of Christmas Island².

As to external characters, the oil-gland, as in other species of *Phaethon*, is densely tufted; the skin is very emphysematous; I

¹ "Tentamen Monogr. zool. generis *Phaethon*," Mém. Acad. Sci. St. Pétersb. (6) iii. 1840, p. 263.

² "On the Natural History of Christmas Island, in the Indian Ocean," P. Z. S. 1888, p. 528.

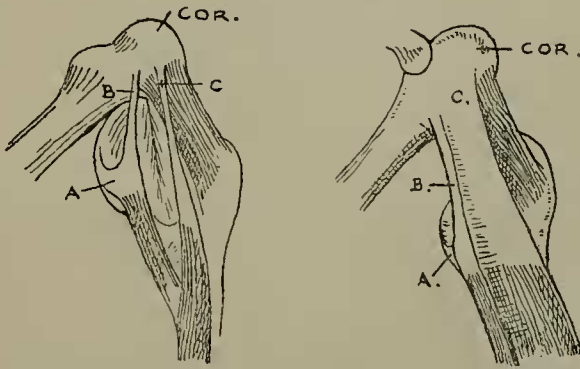
could find no aftershaft ; there are 12 rectrices ; the pollex is clawed. The bird is aquincubital.

The anatomy of the soft parts of this bird has been briefly touched upon by Brandt in the memoir already cited, where the tongue, palate, and larynx are figured. The presence of two carotid arteries, the muscular formula of the leg, and one or two other muscles have been referred to by Garrod¹. I am not aware, however, to what species these notes refer, and, as will be seen presently, specific differences are apparently marked in the internal organs.

The specimen of the bird which I dissected had had the intestines removed. I find, however, from a MS. note of Garrod that the intestines of an individual dissected by him were $3\frac{1}{2}$ feet long, the large intestine only $\frac{3}{4}$ inch, and the cæca "buttons." The left lobe of the liver is the smaller, and there is a gall-bladder.

The *Pectoralis primus* was not very markedly two-layered. Mr. Forbes found a specimen dissected by himself (? species) to have a single-layered pectoralis. It has the second insertion on to the flat common Biceps tendon found in so many Steganopodes. I found no *Pectoralis abdominalis*.

Fig. 1.



Origin of Biceps in *Pelecanus* (left-hand figure) and *Phalacrocorax* (right-hand figure). (After Fürbringer.)

Cor., Coracoid ; C, coracoidal head of Biceps ; A, attachment of humeral head to Humerus ; B, its prolongation to Coracoid.

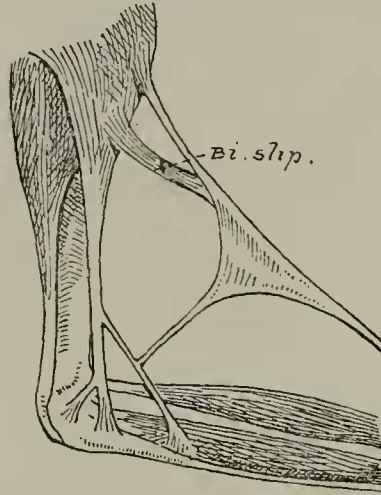
The *Biceps* (fig. 1) is fashioned like that of *Phalacrocorax*, not like that of *Pelecanus* and still less like the Biceps of *Sula* and *Fregata* ; the humeral head in fact is a narrowish tendon attached to but still distinct from (by reason of its greater thickness) the wide thin tendon which is the coracoidal head of the muscle ; the former has also, as shown in the drawing (fig. 1, A), a short special tendinous attachment to the head of the humerus. The muscular slip to the patagium (Biceps slip) arises from the humeral head of the Biceps.

The *Patagialis* muscle in part performs the function of a deltoid ;

¹ "On certain Muscles in the Thigh of Birds &c.," P. Z. S. 1873, p. 628 &c.
"Notes on the Anatomy of *Plotus ankinga*," P. Z. S. 1876, p. 335 &c.

for some of its fibres, instead of ending in the patagial tendons, are inserted on to the deltoid crest. The patagialis brevis tendon (fig. 2) is somewhat wide and diffuse; it gives off a wristward slip near to its insertion on the forearm, from which arises a patagial fan joining the tensor longus tendon. The Biceps slip has already been referred to; it joins the tensor longus tendon.

Fig. 2.

Muscles and tendons of Patagium of *Phaethon*.

Bi. slip, Biceps slip.

The *Anconæus*, as in other Steganopodes, has besides its scapular origin a tendinous connection with the scapula and with the humerus.

I could not find an *Expansor secundariorum*.

The *Latissimus dorsi anterior* is less than half the size of the *posterior*. The most posterior portion of the latter arises as a special slip below (covered by) the sartorins. The tendon of insertion of the *posterior* division is, as usual, inserted on to the humerus in common with the humeral attachment of *Anconæus*.

There appears to be no *Lat. dorsi metapatagialis*.

The two *Rhomboidei* are about equisized. The profundus springs aponeurotically.

The *Serratus superficialis* is as usual made up of an anterior and posterior portion. The anterior portion is composed of two slips arising respectively from the last cervical and the first dorsal rib; its tendon of insertion is connected with the *subscapularis externus*. The posterior division arises tendinously from dorsal ribs 2, 3, and 4.

The *Serratus profundus* arises from the last cervical and the first two dorsal ribs; the several slips decrease in size from before backwards.

The *Serratus metapatagialis* is a large muscle arising from the four ribs in front of the last.

The *Sartorius*, as already mentioned, just overlaps the *latissimus dorsi posterior*.

The *Gluteus primus* is not a large muscle; its origin does not extend back behind the acetabulum.

The *Biceps* is continuous at its origin with the *semimembranosus*. As Garrod has pointed out, it is remarkable for the absence of a *Biceps* sling—a peculiarity which it shares with certain Swifts.

As Garrod has also pointed out, the muscular formula of the leg is *AXY*—¹.

The *deep Flexors* blend at the middle of the metatarsus; no slip is given off to the hallux, which has a short flexor of its own.

The osteology of *Phaethon* has been described and figured as concerns the skull and a few other bones by Brandt². Two species, *P. candidus* and *P. rubricauda*, are dealt with by Milne-Edwards³. Some notes upon the axial skeleton are contained in Mivart's⁴ account of that portion of the skeleton of the *Pelecanidæ*.

Gadow⁵ has referred to the less modified condition of the palate in *Phaethon*. This is certainly the case, but *Fregata* is not far removed from *Phaethon*.

In *Phaethon* (fig. 3, p. 292) the palatines are narrowed posteriorly and come into contact for a short space in the middle line, where, however, they are not fused. The vomer is knife-blade shaped and ends in a point anteriorly between the maxillo-palatines; it splits into two posterior limbs just behind the maxillo-palatines.

In *Fregata* (fig. 4, p. 293) the two palatines not only come into contact, but are actually fused for about the same distance posteriorly; but the internal laminae of the palatines remain distinct and are not melted into a median ridge as is the case with the remaining genera of *Steganopodes*, where, moreover, the palatines are, as is well known, much more largely fused.

In both *Phaethon* and *Fregata* the maxillo-palatines do not meet across the middle line posteriorly, the appearance of this part of the skull being very *Accipitrine*. I have already referred to the vomer of *Phaethon*; in *Fregata* this bone lies more deeply (when the skull is viewed from below), but does not bifurcate posteriorly where it is ankylosed, as in *Phaethon*, with the palatines. In *Phalacrocorax*, *Plotus*, and *Sula* the backwardly projecting, horizontal and separated laminae of the maxillo-palatines are absent and it seems to be doubtful whether there is any vomer.

Pelecanus comes nearest in this particular to *Fregata* and *Phaethon*, but the regions of the maxillo-palatines in question are united across the middle line by help of a distinct septum, which may be at least partly the anterior portion of the vomer.

¹ Fürbringer in the table of characters marks the ambiens of *Phaethon* as present. I take it that this is merely a misprint.

² "Beiträge zur Kenntniss der Naturg. der Vögel," Mém. Ac. Sci. St. Pétersbourg, (6) iii. p. 81.

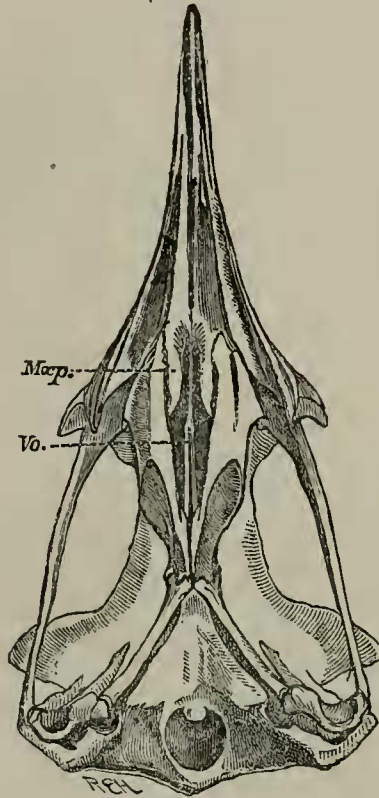
³ Histoire Naturelle de Madagascar.

⁴ "On the Axial Skeleton of the *Pelecanidæ*," Trans. Zool. Soc. x. p. 315.

⁵ Aves, in Bronn's 'Thierreich,' Syst. Th. p. 101.

Brandt has pointed out that *Fregata*¹, unlike other Steganopodes but like certain Petrels &c., has an "ossiculum lacrymo-palatinum." In the lacrymal of one side of my specimen of *Phaethon* I found a minute separate ossification at the end of that bone, which may be regarded as the homologue of the os uncinatum as it is termed by several authors.

Fig. 3.



Phaethon: palatal aspect of skull.

Vo., vomer; *Maxp.*, maxillo-palatines.

The lacrymal of *Phaethon* is more like that of *Fregata* than of any other Steganopode, in that it is not ankylosed above with the frontal. The skull of *Phaethon*, however, differs from that of *Fregata* as of all Steganopodes in the pervious nostrils, in the absence of a groove running from the nostril towards the end of the beak, and in the presence of a considerable foramen towards the middle of each ramus of the lower jaw, as in *Otis*, *Eudromias*, *Ædicnemus*, &c.

So different are the skull characters of *Phaethon* from those of the typical Steganopodes, that, were it not for *Fregata*, the bird

¹ It may be mentioned (in a footnote, as not germane to the general argument) that *Fregata* possesses rudiments, ankylosed to the jugal, of the ossiculum supra-jugale of the Cormorant and perhaps of *Sula*, noted in those Birds by Brandt.

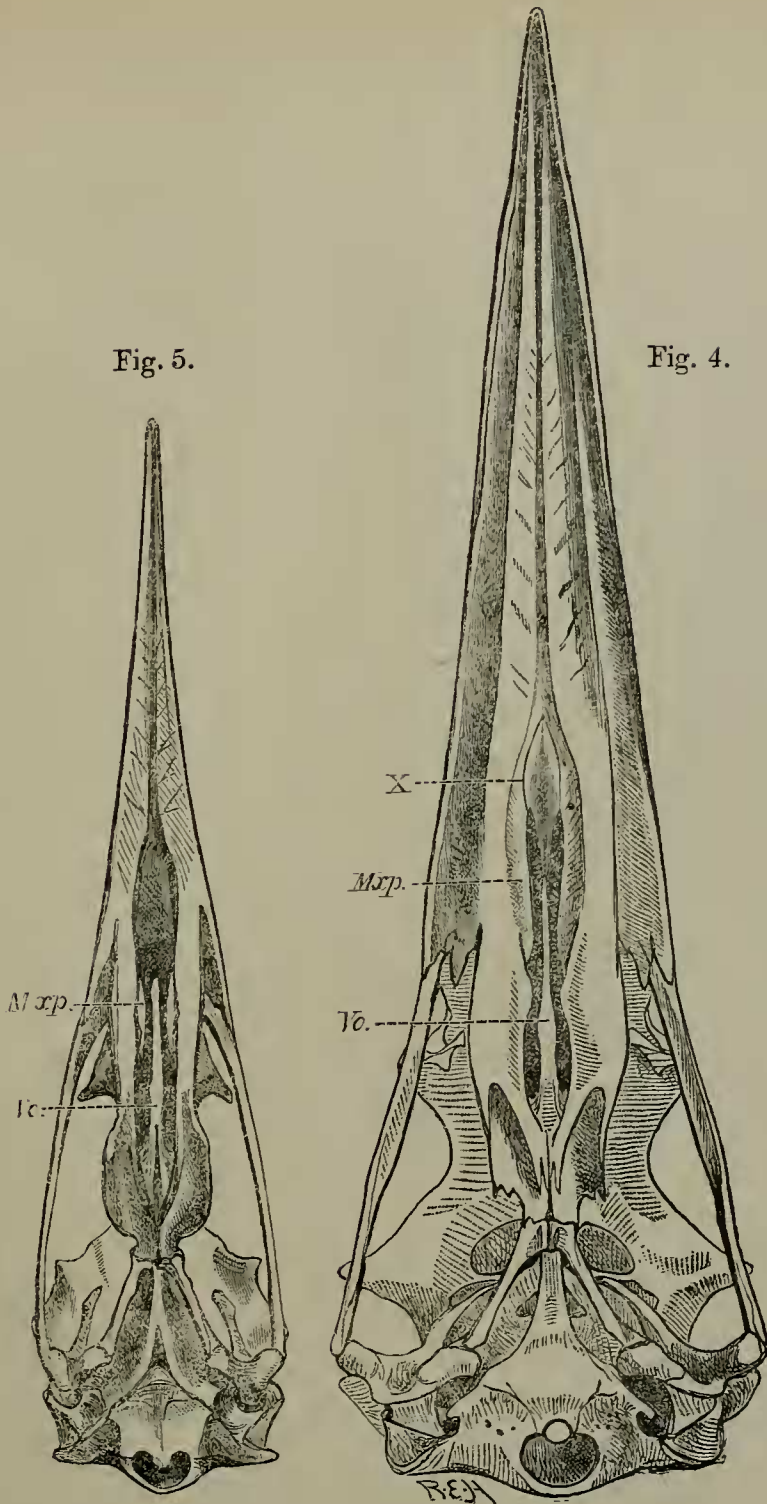


Fig. 4.—*Fregata*: palatal aspect of skull.
 X, upwardly directed part of maxillo-palatines. Other lettering as in fig. 3.

Fig. 5.—*Æchmophorus*: palatal aspect of skull.
 (Lettering as in fig. 3.)